One-step potentiostatic electrodeposition of polypyrrole/graphene oxide/ multi-walled carbon nanotubes ternary nanocomposite for supercapacitor

ABSTRCT

A ternary nanocomposite consisting of polypyrrole (PPy), graphene oxide (GO) and multi-walled carbon nanotube (MWCNT) for supercapacitor was prepared via facile one step potentiostatic technique. Field emission scanning electron microscopy (FESEM) images displayed a randomly entangled nanostructure of MWCNT with rough wrinkle surface of GO incorporating with PPy granular structure represent the morphology of PPy/GO/MWCNT nanocomposite. The ternary nanocomposite was further justified its chemical composition by using Fourier transform infrared spectroscopy (FTIR) and Raman spectroscopy. PPy/GO/MWCNT exhibited a high specific capacitance of 358.69 F g−1 at a scan rate of 100 mV s−1 in 1 M Na2SO4, which is comparatively higher than both binary nanocomposites, PPy/MWCNT (207.52 F g−1) and PPy/GO (139.03 F g−1). The PPy/GO/MWCNT nanocomposite also possessed much longer charge-discharge time and excellent cycling stability (88.69%) with the specific energy of 40.45 Wh/kg and specific power of 441.24 W/kg. Therefore, PPy/GO/MWCNT nanocomposite is a potential electrode material for high-performance supercapacitor.

Keyword: Ternary nanocomposite; Supercapacitor; Polypyrrole; Graphene oxide; Carbon nanotube.